What is claimed is:

1. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

c) coating a first photoresist layer on said first silicon oxide layer;

d) defining a first pattern on said first photoresist layer;

e) transferring said first pattern onto said first silicon oxide layer;

f) performing at least one additional processing step that does not perturb said first pattern while said silicon substrate under said first pattern is protected by said first silicon oxide layer; and

g) etching, after the step of performing said at least one additional processing step, said first pattern into said silicon substrate.

2. The method of claim 1, wherein said at least one additional processing step comprises coating, defining, and transferring at least one additional pattern onto at least one of said first and second silicon oxide layers.

3. The method of claim 2, wherein said at least one additional processing step further comprises etching said at least one additional pattern into said silicon substrate.

4. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

c) coating a first photoresist layer on said first silicon oxide layer;

d) defining a first pattern on said first photoresist layer;

e) transferring said first pattern onto said first silicon oxide layer;

f) removing said first photoresist layer;

g) coating a second photoresist layer on said first silicon oxide layer;

h) defining a second pattern on said second photoresist layer, wherein said second pattern includes said first pattern as a subset, whereby said first pattern is not occluded by said second photoresist layer;

i) etching, after the step of defining said second pattern, said first pattern into said silicon substrate for a first period of time;

j) transferring said second pattern onto said first silicon oxide layer; and

k) etching simultaneously, after the step of transferring said second pattern, said first and second patterns for a second period of time.

5. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

c) coating a first photoresist layer on said first silicon oxide layer;

d) defining simultaneously a first pattern and a second pattern on said first photoresist layer;

e) transferring said first pattern and said second pattern onto said first silicon oxide layer;

f) removing said first photoresist layer;

g) coating a second photoresist layer on said first silicon oxide layer;

h) defining simultaneously a third pattern and said first pattern on said second photoresist layer such that said second pattern remains occluded by said second photoresist layer;

i) etching, after the step of defining said third pattern and said first pattern, said first pattern into said silicon substrate for a first period of time;

j) transferring said third pattern onto said first silicon oxide layer;

k) etching simultaneously, after the step of transferring said third pattern, said first and third patterns for a second period of time;

l) removing said second photoresist layer; and

m) etching simultaneously said first, second and third patterns for a third period of time.

6. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) doping said first surface with a dopant of a same conductivity type as a conductivity type of said substrate;

c) forming a pad oxide on said first surface;

d) forming a silicon nitride film on said pad oxide;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said pad oxide;

f) performing, after step (e), at least one intervening process step, at least one of said at least one intervening process steps providing a thermal oxidation of said silicon substrate;

g) removing, after step (f), said at least one silicon nitride contact area and any of said pad oxide beneath said at least one silicon nitride

contact area, thereby forming at least one contact area on said first surface; and

h) depositing a metal on said at least one contact area.

7. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) doping said first surface with a dopant of a same conductivity type as a conductivity type of said substrate;

c) forming a pad oxide on said first surface;

d) forming a silicon nitride film on said pad oxide;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said pad oxide;

f) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

g) coating a first photoresist layer on a first one of said first and said second silicon oxide layers;

h) defining a first pattern on said first photoresist layer;

i) transferring said first pattern onto said first one of said first and said second silicon oxide layers;

j) coating a second photoresist layer, defining, and transferring a second pattern onto a second one of said first and second silicon oxide layers;

k) removing said second photoresist layer;

l) coating a third photoresist layer and defining a third pattern onto said second one of said first and second silicon oxide layers, said third pattern including as a subset said second pattern;

m) etching, after the step of defining said third pattern, said second pattern into said silicon substrate for a first period of time;

n) transferring said third pattern onto said second one of said first and second silicon oxide layers;

o) etching simultaneously, after the step of transferring said third pattern, said second and third patterns into said silicon substrate for a second period of time;

p) removing said third photoresist layer if said third photoresist layer occludes said first pattern;

q) etching said first pattern into said silicon substrate;

r) removing, after step (q), said at least one silicon nitride contact area and any of said pad oxide beneath said at least one silicon nitride contact area, thereby forming a contact area on said first surface; and

s) depositing a metal on said contact area.

8. A method according to claim 7, wherein said first one of said first and second silicon oxide layers and said second one of said first and second silicon oxide layers are the same layer.

9. A method according to claim 7, wherein said first one of said first and second silicon oxide layers and said second one of said first and second silicon oxide layers are different layers.

10. A method for fabricating an integrated liquid chromatography/electrospray ionization microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having an ejection surface and an opposing separation surface;

b) forming first and second silicon oxide layers on said ejection and separation surfaces of said substrate, respectively;

c) doping said ejection surface with a dopant of a same conductivity type as a conductivity type of said substrate;

d) forming a silicon nitride film on said first silicon oxide layer;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said first silicon oxide layer;

f) oxidizing said substrate, after step (e), to increase said first and second silicon oxide layers;

g) coating a first photoresist layer on said second silicon oxide layer;

h) defining a first pattern on said first photoresist layer, said first pattern including a separation channel, a separation channel terminus, and a plurality of separation posts;

i) transferring said first pattern onto said second silicon oxide layer;

j) removing said first photoresist layer;

k) coating, defining, and transferring a second pattern consisting of a fluid reservoir and a first portion of a nozzle channel onto said second silicon oxide layer when said first pattern does not include said fluid reservoir; otherwise, coating and defining said second pattern onto said separation surface when said fluid reservoir is also included in said first pattern;

l) etching said second pattern into said silicon substrate;

m) coating, defining, and transferring a third pattern onto said first silicon oxide layer, said third pattern consisting of an introduction channel and a second portion of said nozzle channel, said third pattern being aligned on said first silicon oxide layer such that said second portion and said first portion of said nozzle channel are substantially axially aligned, and such that said fluid reservoir and said introduction channel are substantially aligned;

n) removing all photoresist provided in coating, defining, and transferring said third pattern;

o) coating and defining a fourth pattern onto said first silicon oxide layer, said fourth pattern consisting of an introduction channel, a second portion of said nozzle channel, and a recessed area surrounding an unrecessed area, wherein a nozzle is defined by said nozzle channel within said unrecessed area;

p) etching, after the step of defining said fourth pattern, said third pattern into said silicon substrate for a first period of time;

q) transferring said fourth pattern onto said first silicon oxide layer;

r) etching simultaneously, after the step of transferring said fourth pattern, said third and fourth patterns for a second period of time;

s) removing at least all photoresist layers which occlude said first pattern;

t) etching said first pattern into said silicon substrate;

u) forming, after step (t), an isolation layer on all silicon surfaces of said silicon substrate;

v) attaching, after step (u), a cover substrate to said separation surface of said silicon substrate;

w) removing, after step (v), said at least one silicon nitride contact area and any of said pad oxide beneath said at least one silicon nitride contact area, thereby forming at least one contact area on said ejection surface; and

x) depositing a metal on said at least one contact area.

11. A method according to claim 10, wherein said isolation layer is an electrical isolation layer.

12. A method according to claim 10, wherein said isolation layer is a biocompatibility isolation layer.

13. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) doping said first surface with a dopant of a same conductivity type as a conductivity type of said substrate;

c) forming a pad oxide on said first surface;

d) forming a silicon nitride film on said pad oxide;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said pad oxide;

f) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

g) coating a first photoresist layer on one of said first and said second silicon oxide layers;

h) defining a first pattern on said first photoresist layer;

i) transferring said first pattern onto said one of said first and said second silicon oxide layers;

j) removing said first photoresist layer;

k) coating a second photoresist layer on said one of said first and said second silicon oxide layers;

l) defining a second pattern on said second photoresist layer, wherein said second pattern includes as a subset said first pattern, whereby said first pattern is not occluded by said second photoresist layer;

m) etching, after the step of defining said second pattern, said first pattern into said silicon substrate for a first period of time;

n) transferring said second pattern onto said one of said first and said second silicon oxide layers;

o) etching simultaneously, after the step of transferring said second pattern, said first and second patterns for a second period of time;

p) removing, after step (o), said at least one silicon nitride contact area and any of said pad oxide beneath said at least one silicon nitride contact area, thereby forming at least one contact area on said first surface; and

q) depositing a metal on said at least one contact area.

14. A method for fabricating an electrospray ionization microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having an injection surface and an opposing ejection surface;

b) forming first and second silicon oxide layers on said injection and ejection surfaces of said substrate, respectively;

c) doping a portion of said silicon substrate through said first silicon oxide layer with a dopant of a same conductivity type as a conductivity type of said substrate;

d) forming a silicon nitride film on said first silicon oxide layer;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said first silicon oxide layer;

f) oxidizing said substrate, after step (e), to increase said first and second silicon oxide layers;

g) coating a first photoresist layer on said first silicon oxide layer;

h) defining a first pattern on said first photoresist layer, said pattern consisting of a nozzle channel;

i) transferring said first pattern onto said first silicon oxide layer;

j) etching said first pattern into said silicon substrate for a first period of time;

k) removing said first photoresist layer;

l) coating a second photoresist layer on said second silicon oxide layer;

m) defining a second pattern on said second photoresist layer, said second pattern consisting of a nozzle orifice, said second pattern being aligned on said second photoresist layer such that said nozzle orifice and said nozzle channel are substantially axially aligned;

n) transferring said second pattern into said second silicon oxide layer;

o) removing said second photoresist layer;

p) coating a third photoresist layer on said second silicon oxide layer;

q) defining a third pattern in said third photoresist layer, said third pattern consisting of a recessed region and a portion corresponding to said nozzle orifice, wherein said second pattern is not occluded by said third photoresist layer;

r) etching, after the step of defining said third pattern, said second pattern into said silicon substrate for a second period of time;

s) transferring said third pattern into said second silicon oxide layer;

t) etching simultaneously, after the step of transferring said third pattern, said second and third patterns into said silicon substrate for a third period of time;

u) forming, after step (t), an isolation layer on at least all silicon surfaces of said nozzle channel;

v) removing, after step (u), said at least one silicon nitride contact area and any of said first silicon oxide layer beneath said at least one silicon nitride contact area, thereby forming at least one contact area on said first surface; and

w) depositing a metal on said at least one contact area.

15. A method according to claim 14, wherein said isolation layer is an electrical isolation layer.

16. A method according to claim 14, wherein said isolation layer is a biocompatibility isolation layer.

17. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) doping said first surface with a dopant of a same conductivity type as a conductivity type of said substrate;

c) forming a pad oxide on said first surface;

d) forming a silicon nitride film on said pad oxide;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said pad oxide;

f) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

g) coating a first photoresist layer on one of said first and said second silicon oxide layers;

h) defining a first pattern on said first photoresist layer;

i) transferring said first pattern onto said one of said first and said second silicon oxide layers;

j) performing at least one additional processing step that does not perturb said first pattern while said silicon substrate under said first pattern is protected by said first silicon oxide layer;

k) etching, after the step of performing said at least one additional processing step, said first pattern into said silicon substrate;

l) removing, after step (k), said at least one silicon nitride contact area and any of said pad oxide beneath said at least one silicon nitride contact area, thereby forming at least one contact area on said first surface; and

m) depositing a metal on said at least one contact area.

18. The method of claim 17, wherein said at least one additional processing step comprises coating, defining, and transferring at least one additional pattern onto at least one of said first and second silicon oxide layers.

19. The method of claim 18, wherein said at least one additional processing step further comprises etching said at least one additional pattern into said silicon substrate.

20. A method for fabricating a liquid chromatography microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having an introduction surface on an introduction side of said substrate and an opposing separation surface on a separation side of said substrate;

b) forming first and second silicon oxide layers on said introduction and separation surfaces of said substrate, respectively;

c) doping a portion of said introduction surface through said first silicon oxide layer with a dopant of a same conductivity type as a conductivity type of said substrate;

d) forming a silicon nitride film on said first silicon oxide layer;

e) patterning and etching said silicon nitride film to form at least one silicon nitride contact area on said first silicon oxide layer;

f) oxidizing said substrate, after step (e), to increase said first and second silicon oxide layers;

g) coating a first photoresist layer on said introduction side;

h) defining a first pattern on said first photoresist layer, said first pattern consisting of an introduction channel and an introduction-side exit channel;

i) transferring said first pattern onto said first silicon oxide layer;

j) etching said first pattern into said silicon substrate;

k) removing said first photoresist layer;

l) coating a second photoresist layer on said separation side;

m) defining and transferring a second pattern onto said second silicon oxide layer, said second pattern including a separation channel, a separation channel terminus, and a plurality of separation posts;

n) removing said second photoresist layer;

o) coating a third photoresist layer on said separation side;

p) defining and transferring a third pattern consisting of a fluid reservoir and a separation-side exit channel onto said second silicon oxide layer when said second pattern does not include said fluid reservoir, such that said reservoir is substantially aligned with said introduction channel and said separation-side exit channel is substantially aligned with said introduction-side exit channel; otherwise, defining said third pattern onto said separation surface when said fluid reservoir is also included in said second pattern, such that said reservoir is substantially aligned with said introduction channel and said separation-side exit channel is substantially aligned with said introduction-side exit channel;

q) etching said third pattern into said silicon substrate so that said reservoir connects with said introduction channel and said separation-side exit channel connects with said introduction-side exit channel;

r) removing said third photoresist layer;

s) etching said second pattern into said silicon substrate;

t) forming, after step (s), an isolation layer on all silicon surfaces of said silicon substrate;

u) attaching, after step (t), a cover substrate to said separation surface of said silicon substrate;

v) removing, after step (u), said at least one silicon nitride contact area and any of said first silicon oxide layer beneath said at least one silicon nitride contact area, thereby forming at least one contact area on said first surface; and

w) depositing a metal on said at least one contact area.

21. A method according to claim 20, wherein said isolation layer is an electrical isolation layer.

22. A method according to claim 20, wherein said isolation layer is a biocompatibility isolation layer.

23. A method for fabricating a microelectromechanical device, comprising the steps of:

a) providing a silicon substrate having first and second opposing surfaces;

b) forming first and second silicon oxide layers on said first and second surfaces of said substrate, respectively;

c) coating a first photoresist layer on said first silicon oxide layer;

d) defining a first pattern on said first photoresist layer;

e) transferring said first pattern onto said first silicon oxide layer;

f) coating, defining, and transferring a second pattern onto one of said first and second silicon oxide layers;

g) removing all photoresist provided in coating, defining, and transferring said second pattern;

h) coating and defining a third pattern onto said one of said first and second silicon oxide layers, wherein said third pattern includes as a subset said second pattern, whereby said second pattern is not occluded;

i) etching, after the step of defining said third pattern, said second pattern into said silicon substrate for a first period of time;

j) transferring said third pattern onto said one of said first and second silicon oxide layers;

k) etching simultaneously, after the step of transferring said second pattern, said second and third patterns for a second period of time;

l) removing at least all photoresist layers which occlude said first pattern; and

m) etching said first pattern into said silicon substrate.